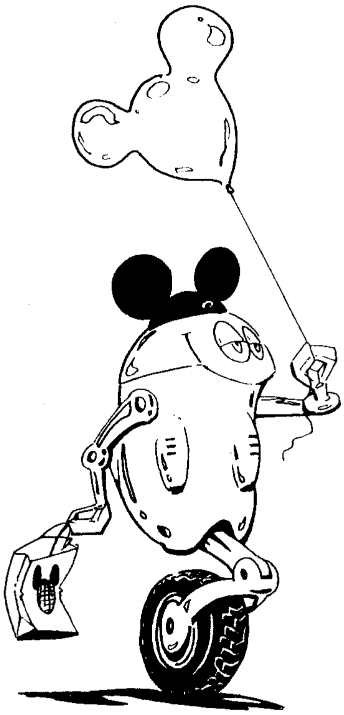
PYROTECHNICS #49

The Now And Then Newsletter Of General Technics



Quarks

• Some of our friends are becoming video stars. A peculiar program called *Wild Chicago* airs weekly on WTTW (channel 11), the PBS station in Chicago. It features strange and unusual local places, stores, clubs, and institutions. Mary Lynn Johnson wrote to the producers and suggested that they take a look at The Stars Our Destination, the all-SF bookstore on Clark Street. So at the end of May, host Ben Hollis—attired as usual in bush jacket, pith helmet, and binoculars—and a camera crew raided the store, shooting paperbacks, posters, and customers in their trademark fast-cut, slanted-floors, dizzying-pan style. Co-owner Alice Bentley retained remarkable aplomb and dignity explaining the world of science fiction and fandom while a fisheye lens loomed inches from her nose. Bill Higgins provided background music for the video, performing Jeff Duntemann's "Zero-G Polka" on the baritone ukulele. Must be nice to have television certify you as an official Wild Person.

• In Champaign, Mary, Rolf, and Anders Wilson added another little techie to their family on 24 July 1991 when Torsten Robert Wilson appeared. Torsten massed 3.6 kilograms and weighed 8 pounds, 1 ounce, standing 52 centimeters (20.5 inches) tall. Not to be outdone, on 16 November Angel and Chris Johnston introduced yet another fan, David Christopher Johnston, to the fannish colony on Pratt Avenue in Chicago. David massed only 3.1 kg, but doubled in mass in his first month. If this keeps up, a 12-tonne baby may be terrorizing the Windy City by his next birthday...

• We were pleased to find that Guy Consolmagno, planetary astronomer, author, and former Peace Corps volunteer, had washed up on the shores of Lake Michigan. Guy is now a Jesuit brother studying at Loyola University of Chicago. His book with Dan Davis, *Turn Left at Orion*, has been published by Cambridge University Press (it's a swell guide to observing the skies with a small telescope or binoculars). He's begun work on a planetary-science textbook, and has recently been appointed an Associate Astronomer at the Vatican Observatory. Nice to have you in town, Brother Guy.

• Congratulations to our own Martha Soukup for joining the distinguished ranks of Hugo Losers. Her story "Over the Long Haul," in the March 1990 issue of *Amazing,* was a nominee for Best Novelette but lost out to a Mike Resnick story. We're proud anyway.

• Barry Gehm has been busy coining new words lately.
Cryomagnetomancy: the arcane art of predicting the future by reading the notes which fall off your refrigerator. (See "A Refrigerator Smarter Than You Are" in this issue.)
Oxyvitic: (from the Latin *oxy,* sharp or sour, and the Latin *vitus,* grape) With sour grapes.

• Worldcon follies
Letter from Lee Hart (incl. some Berserker memoirs)
Letter from Dave Levine
Missive from Trembley
Valerie and Nick Santore: (312)944-7058 (maybe)
Jim Fuerstenberg: (708)394-3952
Valerie Santore?

My First Laser

by Robert M Alway

In the summer of 1974 I worked in a miserable factory making auxiliary gas tanks. That fall I used my ill gotten gains to do what I had fantasized about doing all my young years. That was to buy everything (well Nearly everything.) I ever wanted from the Edmund Scientific catalogue. At the top of the list was a 1 milliwatt Spectra Physics laser and some holograms. Now, holograms are fascinating items, but there is only so much time you can spend looking at a watch and magnifier. Besides, a laser fairly screams out for further experimentation. Among the experiments I tried was to determine how big of a spot it would produce on the sidewalk far down the hill beneath my dormitory. It turned out to be remarkably difficult to see the spot because it diverged to a diameter of only a few inches. After some practice I was able to see where I was actually aiming the laser. The technique was to shine the laser at a nearby object and gradually work the dot down the hill, keeping track all the way, until at last the spot was barely visible on the sidewalk below.

I should now describe in a more detailed manner the location in which I was situated. I was in a friend's top floor room in Lee house, a part of Baits housing complex for upperclassmen and graduate students on the north campus of the University of Michigan. My crow's nest vantage point overlooked a sidewalk that connected Bursley Hall (A dormitory of immense proportions.) and the music school. A wooded area lay as a backdrop to the walkway. Before and alongside the path was a road leading up from the music school on the right, to in front of Bursley Hall on the left, where it turned sharply uphill to the road serving Baits housing. All was clearly visible from my perch. Nothing was safe.

What happens when you shine a laser on the sidewalk in front of someone? Only a carefully planned and executed scientific experiment could determine the truth. I knew it was my duty, as a scientist, to find out. Early results were disappointing. Students would walk by and not even notice the red dot tracking along a dozen feet in front of their path.

In time I became more skilled at aiming the laser-holding the back end, with its heavy transformer, on my shoulder and pointing the front with my right hand like an infantryman with a bazooka. I was able to put a remarkably steady point of light precisely where I wanted it. When I began placing the red dot within three feet of a 'target' the 'target' began to notice. Some reacted in a nervous manner, looking into the woods to see if a mugger lurked. Others carefully avoided stepping on the dot that preceded them on the sidewalk.

The most enjoyable experiment was shining the dot on one member of a couple. This often produced a remarkable "Tinkerbelle effect". The people would act as if the red dot was a solid, perhaps even living object. "Its on your arm". "Brush it off me, brush it off me". Various attempts at removing or destroying the dot would follow-much to the amusement of the remote perpetrators. It never occurred to the victim(s) to check the shadow to see where it really came from. Of course "Tinkerbelle" would fly away before anyone was given much time to think about it.

Bursley Hall itself became a target. Much more distant than the walk, the dormitory required great care in targeting. Once I managed, through great endurance and exemplary skill, to hold the beam of my laser against the back wall of a darkened dorm room. Motion in the room indicated the presence of an inmate ducking below the beam. After several minutes with no reaction and a rapidly tiring arm I abandoned the target. Another dorm room was much more satisfying. After a minute or two of a red spot on his wall the occupant was seen to shout something out his window and slam it shut. Seconds later, the venerable cliche', "F___ Y__", and the 'bang' of a window slamming were heard through the night air. My only regret is that I didn't have a stopwatch to help me calculate the distance to Bursley Hall. Some days later I heard through the grapevine that a student in Bursley Hall had a visitation from God and had spent several minutes praying to a spot on the wall. I never confirmed the report.

After several nights of this nonsense a campus police car appeared on the road leading uphill between Bursley Hall and ourselves, (I had numerous accomplices.) carefully positioned to be able to observe the walkway, and incidentally, be observed. I suspect his presence was due to the fact we had been stopping cars by shining a red light on their hoods. Some cars we managed to start and stop repeatedly by turning the laser off and on. We managed to get the constable to turn his headlights on once or twice by putting a red dot in safe locations. After a few evenings with no results, the police car disappeared.

Near the end of our operations I decided it was time for me to personally check out our red dot. One of my accomplices turned the beam on my hand while I was standing on the walk. I discovered the diameter of the spot was between four and six inches. (Greater precision was impossible to obtain due to motion of the beam.) I also found that it was nearly impossible to determine where it was coming from, even though I knew the source, unless the spot hit me directly in the eye.

Not everybody was fooled. While I was examining the laser spot on my hand, a student coming along the walk stated, "Hey man don't worry, you're not stoned. There are just some guys up there with a laser!"

A year or two later I brought my laser out of retirement as a temporary replacement for a telephone. But that is another story.

[Ah, the innocent pastimes of our youth. Regrettably, we must discourage readers from trying the Tinkerbelle trick today. Someone is likely to mistake you for a mad sniper with a laser gunsight, and before you can say "stimulated emission of radiation" you'll be up to your ass in SWAT teams. Our thanks to Robert for this memoir; any other good techie-toy reminiscences out there? --BG]

SEAL OF
General Technics
QUALITY

Physics Carols

Robert C. Hilborn
Amherst College, Amherst, MA 01002

The songs collected here are part of a tradition that began at Oberlin College in the mid-1970s, when I was a young assistant professor of physics there. A group of physics majors began writing physics lyrics, in the style of Tom Lehrer, to be sung to the tune of traditional Christmas carols. Some of the early perpetrators of those permuted lyrics have confessed in letters to *The Oberlin Alumni Magazine* (Winter, 1989). Just before the Christmas holidays, the students would travel around the town of Oberlin, singing these carols outside the homes of physics faculty members, much to the puzzlement of children and neighbors. They would also provide a few minutes entertainment during the final lectures of introductory physics courses.

When I moved to Amherst in 1986, I brought some of that tradition with me. New developments in physics have prompted new compositions and the updating of some of the older lyrics. For better or worse, the authors of these lyrics, by and large, remain anonymous, although I must admit to some editing, revision, and composition myself. Reports from Oberlin indicate that the tradition continues there, and the songs printed here are only a subset of a larger collection.

Deck the Halls

Deck the halls with spools of wire
Fa, la, la, etc.
My oscilloscope's on fire...
Who has taken my resistors?...
Sing a song of bad transistors...

Fill the lab with amplifiers
Fa, la, la, etc.
My new circuit has no wires...
All the op-amps have no gain...
Electronics is a pain.

Work till midnight, then work longer...
Watch that circuit get still wronger...
If it has a major defect...
Fix it as an honors project.

Shoot the walls with Star Wars' phasors...
Made from Hunter's diode lasers...
Though they glow with opalescence...
Still can't see the darn fluorescence.

Photocells

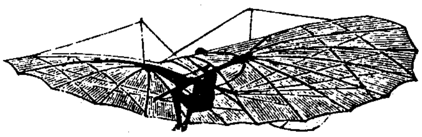
(Sung to the tune of "Jingle Bells.")

Dashing through space-time
At the speed of light
Through vector fields we go
With our colors bright.
Keeping constant speed
In every frame is right.
Oh what fun it is to be a photon in the night.

Chorus:
Decibels, photocells,
Now I'm going to lase.
Oh what fun it is to be a boson in the rays.
Hey!
Grad of dels, colored gels,
Diffraction grating blaze.
Oh what fun it is to be a boson in the rays.

Cut across the lab
By a mirror steered
Through the slits we go
Nothing do we fear.
Back again we come
To the screen we've veered.
Oh what fun it is to be a photon interfered.

(Chorus)



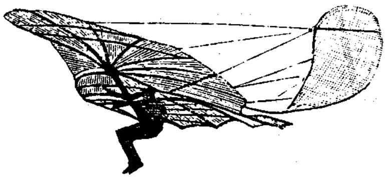
We Three Quarks

(Sung to the tune of "We Three Kings.")

We three quarks fine particles are
Bearing charm we travel afar
Fields and forces, spin of course is
Multiplied by h-bar.
Oh, quarks are wondrous, quarks are light
Quarks have colors, clear and bright.
Still misleading, still exceeding
All the physicists' insight.

We three quarks trade gluons all day
All baryons are made in this way.
Confined inside, we always hide
Unseen forever stay.
Oh, quarks are wondrous, quarks are light
Quarks stay smugly out of sight.
Still misleading, still exceeding
All the physicists' insight.

(Reprinted with the kind permission of Mr. Hillborn, who tells us that he is sending along the updated versions of these songs as well as many new ones. Many thanks from all of us in GT! -- MLSJ)



Storage Tip from a Techie's Wife

Mary Lynn Johnson

Up until recently, Todd kept some of his chips in tubes, others in bins, some loose in the bottom of parts boxes, and still others stuck in styrofoam. Some of these methods are perfectly fine, but I thought there might be a way for storing them that would protect chips and still keep them organized and accessable. I hit upon the idea of video tape boxes. These are the semi-clear plastic replacement boxes available at most any K-Mart-type store.

I took a pair of flush-cutters to one and pared out the plastic bits that stick up inside. Then, I cut two pieces of black conductive foam to fit both inside the lid and inside the box. Hot glued in place and trimmed to ensure good closure, the foam can hold over a hundred average chips face to face. I loaded the box with chips and then stuck a blank mailing label to the spine. Now they can be stored like books and labeled for easy access.

I also found that these boxes can also make a good way to store pencils or other similar small objects with the small disadvantage of occasionally needing a rubber band to keep them tightly closed.

Has anyone else thought of storage ideas the rest of us might be interested in?

Anything Goes

by Fred Robinson

Statistical[1,2] Properties of m&m Candies

Abstract: This article describes the statistical properties of the various colors of m&m's that occur in a random sampling of the 1.69 ounce individual packages. A comparison with a three-pound bag is also made.

Introduction: The most common occurrence of the plain m&m chocolate candy (hereafter referred to simply as "m&m" or "candy") is in 1.69-ounce individual serving bags. These bags may be purchased one by one at nearly any kind of food store[3] for prices ranging up to 50 cents US, or from a wholesale dealer by the case for somewhat less per package. Each bag contains enough m&m's to satisfy a sudden craving for chocolate, although in the author's experience, consumption is followed by a case of the sugar shakes within a few hours.

As with any food packaged by weight, these small m&m bags vary in the number of m&m's they contain. Since plain m&m's are pretty much uniform, this means that the weight varies as well. So much for modern day packaging.

m&m's also come in a variety of colors: Brown, tan, green, orange, yellow, and the recently-returned red. The relative amounts of each color in an individual package is not constant. This study is a search for rhyme or reason in the color distribution.

Method: Over the course of several weeks, or more precisely, four months or so, 50 individual packages of m&m's were tallied by color and consumed. This works out to less than 2 bags per week, and is explained by the presence of other snack foods in the candy drawer maintained by the author. The counts were entered into an electronic spreadsheet[4] and running totals and averages were kept. The tally was stopped at 50 because it seemed like a nice round number, and taking the study out to 100 packages would have taken too long at the aforementioned rate. Another consideration was the fact that soon after the 50th package was tallied, the plain m&m's were replaced by new peanut butter m&m's which have since proven to be a big seller.

Results: The results of the tally are as follows (the entries have been sorted by the total number of m&m's in each package):

	brown	tan	orange	yellow	red	green	total	weight
	12	5	5	16	9	5	52	1.65
	13	11	10	11	6	2	53	1.68
	15	3	10	15	7	3	53	1.68
	16	11	4	7	13	2	53	1.68
	18	6	5	11	8	5	53	1.68
	19	8	5	11	7	4	54	1.71
	9	10	9	10	12	5	55	1.74
	10	11	6	16	7	5	55	1.74
	15	4	4	10	11	11	55	1.74
	16	5	4	17	12	1	55	1.74
	17	3	3	14	16	2	55	1.74
	22	6	3	9	12	3	55	1.74
	10	4	14	12	9	7	56	1.77
	11	7	6	7	14	11	56	1.77
	12	6	5	17	9	7	56	1.77
	16	3	8	16	5	8	56	1.77
	16	8	7	6	13	6	56	1.77
	18	6	9	11	6	6	56	1.77
	19	3	9	13	8	4	56	1.77
	19	7	5	6	8	11	56	1.77
	20	6	4	14	6	6	56	1.77
	21	3	9	11	8	4	56	1.77
	23	3	5	9	15	1	56	1.77
	8	11	7	10	13	8	57	1.80
	11	5	10	13	11	7	57	1.80
	12	5	6	14	14	6	57	1.80
	13	2	10	9	20	3	57	1.80
	16	8	5	7	16	5	57	1.80
	16	7	4	11	11	8	57	1.80
	16	12	7	6	10	6	57	1.80
	17	5	5	11	14	5	57	1.80
	17	4	7	14	7	8	57	1.80
	22	4	9	12	7	3	57	1.80
	23	4	8	8	11	3	57	1.80
	24	3	5	9	10	6	57	1.80
	12	6	4	13	13	10	58	1.84
	15	14	5	13	6	5	58	1.84
	20	12	6	11	7	2	58	1.84
	22	6	7	8	12	3	58	1.84
	27	4	5	11	5	6	58	1.84
	13	14	8	13	6	5	59	1.87
	15	7	7	18	9	3	59	1.87
	15	13	8	12	10	1	59	1.87
	18	10	5	9	8	9	59	1.87
	21	2	6	17	8	5	59	1.87
	12	8	8	14	14	4	60	1.90
	14	5	11	14	12	5	61	1.93
	10	9	7	17	13	6	62	1.96
	11	8	13	12	11	7	62	1.96
	15	10	6	11	14	6	62	1.96
total	802	337	338	586	513	264	2840	

As can be seen, the brown m&m's are generally the most numerous, and green the least. The others fall within these ranges. There is also considerable variation within each color.

This data can be processed to retrieve the following important-sounding statistical numbers:

	brown	tan	orange	yellow	red	green	total
minimum	8	2	3	6	5	1	52
maximum	27	14	14	18	20	11	62
mean	16.04	6.74	6.76	11.72	10.26	5.28	56.80
standard deviation	4.352	3.281	2.471	3.195	3.367	2.564	2.286
variation	18.937	10.768	6.104	10.206	11.339	6.573	5.224
percent of total	28.24	11.87	11.90	20.63	18.06	9.30	100.00

No single package contained exactly the mean counts of m&m's, which is probably due to the quality assurance techniques used at the factory to weed out broken candies. Some packages came close, however.

Running frequency distributions confirms what the standard deviations hint at[5]: The distribution of colors varies wildly from package to package. Orange comes the closest to a normal (bell-shaped) distribution curve; the rest show gaps or multiple peaks in their histograms.

Application (or mis-) of linear regression analysis[6] reveals two general relations between the counts of colors: 1) As the count for one color rises, the counts for all other colors tend to fall (an inverse relationship); and 2) As the total number of m&m's

in a package rises, the counts for all colors also tend to rise (a direct relationship).

There are, however, two exceptions to these generalities: 1) Yellow and orange seem to be directly related, which is to say that as the count of yellows goes up, so does the count of oranges; and 2) The count of browns is inversely related to the total, or as the total goes up, the count of browns goes down.

But these relationships are vague. The slopes of the lines that resulted from the linear regression analysis were never more than thirty degrees (tops) in either direction from the horizontal. Some, especially those where green was the independent variable, were nearly horizontal.

Comparison: To double-check the ratios found above, a three-pound bag of m&m's was tallied and consumed (urp). The results are startlingly different:

	brown	tan	orange	yellow	red	green	total
total	585	122	156	255	260	131	1509
percent of total	38.77	8.08	10.34	16.90	17.23	8.68	100.00

The brown m&m's have a greater plurality, mostly at the expense of the tans and yellows. In addition, a weight study was performed. Although the bag was rated at three pounds, a weighing in a kitchen scale[7] produced 47.75 ounces. Dividing by the number of m&m's in the bag, one gets 0.0316 ounces per m&m, or 31.60 m&m's to the ounce. The last column in the first table shows the actual weights for the 50 tallied m&m packages, calculated using this conversion ratio. There was no opportunity to weigh each individual package, as the scale was at home and can't show hundredths of an ounce very well anyway.

Conclusions:

1. Brown m&m's are most numerous, followed in order by yellow, red, orange, tan, and green. Generally.
2. The stated weight of 1.69 ounces is probably an average guaranteed minimum. Individual packages will usually weigh more.
3. There is little or no correlation between the ratios of colors in the individual packages, except that as any one color grows more numerous, the others become less so.
4. While some colors are consistently low, no colors are ever actually absent from any one package.
5. There is no 5.
6. Consumption of three pounds of m&m's in as many days leads to an upset stomach and general loss of appetite until the candy is gone.

Postscript: At the 1991 World Science Fiction Convention, the author attended a talk on "The Secret Sex Life of Candy," given by one S. Scheiner. While he was speaking of candy in general, Herr Scheiner presented several concrete examples, including the results of breeding experiments with m&m's. It seems, for example, that while brown m&m's breed true, a cross between yellow and brown produces mostly browns, somewhat fewer yellows, and a couple of tans. And so on.

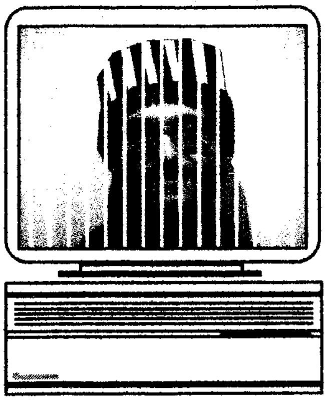
It appears that m&m's are also subject to population pressures which have a tendency to keep the less numerous colors (green, tan) less numerous. This subject will be delved into if the people at work ever request plain m&m's for the candy drawer again.

Notes:

1. Since the author has not worked in a marketing research department for some time, a certain lack of rigor will be detected. This is perfectly normal, and is nothing to worry about.
2. Statistics, World Book Encyclopedia, vol. 18 (So-Sz), pp. 869-872
3. Grocery, party, convenience, gas station, 7-11, etc., as well as the local candy machine.
4. Quattro Pro 1.0, from Borland International
5. Using the following rule of thumb: The smaller the standard deviation, the less overall variance the sample has.
6. As directed by the Quattro Pro Special Edition 1.0 manual, pp. 481-483.
7. Eight ounce capacity, thus requiring that the large bag be split up into several batches for weighing, thus somewhat limiting the accuracy of the whole process.

The Night My Mac Spent in Jail

by David D. Levine



It all started when I decided to upgrade my Mac to the latest version of the Mac system software, called System 7.0. Before I did this, I would have to upgrade some of my software to be compatible with the new system software. One of the things I had to upgrade was the driver for my video card. I got the necessary disk and installed the new driver, but when I rebooted my Mac it just said "Sorry, a system error occurred." I called the manufacturer, and after several phone calls got connected with a helpful person who told me the ROMs on the video card were incompatible with the new software. She said she'd send me new ROMs for free.

The package arrived about a week later. In it were the new ROMs and helpful installation instructions. The helpful installation instructions began with the friendly words

WARNING:

This is not an end-user installation! You must be an Apple Level 1 Certified Technician or you will invalidate both the Apple Macintosh and Radius warranties!

"Ha, ha!" thought I. "I've done this sort of thing millions of times." Well, several times. Well, once. On a PC, not a Mac. But I knew all about proper static safeguards and electronic handling procedures and all that rot, and I was impatient to upgrade my Mac to the latest and greatest. So I washed my hands, slipped on the rubber gloves, administered anaesthesia to the patient, and performed the ROM transplant. I did have a *little* trouble getting the new ROMs to fit, but fortunately I had a sledgehammer handy, and when I was done I knew I had done a good job. Mostly. Apart from that bent bit in the corner, and the scorch marks.

Unfortunately, when the patient came to, it became apparent that something had gone rather wrong. There were vertical lines all over the screen. My start-up screen is a picture of Kate and I, and it looked like we were in jail. In fact, it looked like *everything* was in jail.

Oops.

I crossed my fingers and rebooted, hoping it was a software problem.

Nope, still in jail.

I began to wonder if perhaps I had been a teensy bit hasty in abrogating unto myself the status of Apple Level 1 Certified Technician, with all the rights and privileges appertaining thereunto. Apparently, despite my best intentions (I used the little wrist strap thingie and everything) I had damaged the new ROMs. So I put the patient under again and put the old ROMs back.

Still in jail.

That meant that either I had damaged both sets of ROMs in the exact same way, or that I had broken something in the video card or (shudder) the Mac itself. I tried wiggling all the connectors, but when that didn't break my Mac out of jail I went to bed. If there's one thing I've learned, it's that working on a problem after bedtime only makes the problem worse.

The next morning I asked around at work to see if anyone knew a good Mac technician. Fortunately, I found one person who did; our system administrator, who recommended the guy who fixed all the Macs at work. He had a good track record, and charged half what CompuBusinessLand wanted, and besides he made house calls! So he dropped by that evening and took my Mac away with him. (*Sniff.*)

The next day I got some good news: the technician thought he'd tracked the problem down to a cold solder joint. He'd applied a soldering iron, which seemed to fix the problem, but he wanted to let it "burn in" a while to be sure the fix was permanent. No problem, said I, since Kate and I were going out of town for the weekend.

When the technician delivered my Mac to me at work on Monday, he assured me that he'd run it all weekend with no problems. I took it home, set it up, and exercised it a bit to make sure it was indeed fixed. After about fifteen minutes of menus, windows, and icons, I was convinced that it was rock solid. I got my papers and prepared to start some real work, when I noticed that the little arrow pointer looked funny all of a sudden. There were stripes around it. As I moved the mouse, the pointer left a swath of stripes behind it, like that striped paint that Wile E. Coyote ordered from Acme. The more I moved it, the more my Mac looked like Alcatraz.

I had a sinking feeling. I rebooted my Mac, and was once again saw my own smiling face... in jail.

I called up my friend the technician. We discussed the matter seriously for some time. He was willing to use the soldering iron some more in an attempt to get my Mac to mend its recidivist ways, but we both agreed that the only permanent solution was a whole new video card. This would be more expensive, but would give me greater peace of mind. Unfortunately, the company that made my video card doesn't sell it any more (it's been replaced by a newer, snazzier model that won't talk to my screen), so it might take a while to get a new one.

Well, it turned out even worse than that... the manufacturer wouldn't ship a replacement card to just anyone, you have to be an Authorized Reseller. And, for reasons unknown, even though my technician found a local computer store that was an Authorized Reseller to front for him, the manufacturer would only ship the video card to their Seattle store.

A week went by. Two weeks. Almost three weeks. I had some serious projects to do, including an APA from which, if I didn't write by the deadline, I would be dropped. Where's my video card? Somewhere in limbo between the manufacturer and my technician.

Here it is the very day of the APA deadline, and still no video card. I decide that drastic action is required. I examine the broken video card under a magnifying glass, and spot a couple more possible cold solder joints. I've already voided my Apple Macintosh and Radius warranties... what have I got to lose?

The iron glows red-hot. The solder flows like wine, like blood. A scream pierces the night! (I run cold water on my finger and continue.) Acrid smoke fills the room. Electricity surges! The creature stirs!

Welcome to Macintosh.

It's alive! It's alive!

Feverishly I type my APAzine, fearful that any moment the bars will come slamming down again. But my Mac remains free! I still plan to replace the video card with one that's never been in jail, but for now I know the thrill of victory. Apple Level 1 Certified Technician? Ha! I'm Hawkeye Pierce! I'm the Pope! I'm GOD!

Later that day, someone ran into my parked car.

Glossary:

System 7.0: The latest, coolest thing to put in your Mac. It slices, it dices, it wiggles on its belly. It makes cold calves-foot jelly. Try it, you'll buy it.

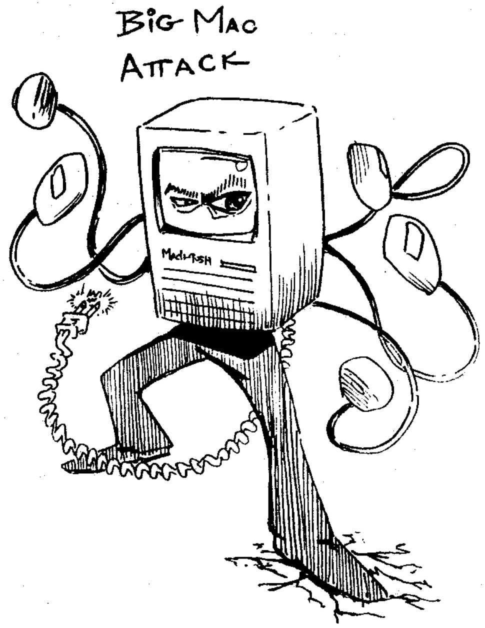
Video card: Like a dance card: something that brings together Macs and screens in polite company. Macs and screens won't dance together without a video card, and without a screen a Mac is a lonely thing indeed. (My Mac is one of the bachelor kind that doesn't come with a screen already built-in.)

Driver: A little elf who lives inside your Mac and tells the bits where to go on the screen. Macs and screens are very fussy and will refuse to go anywhere together without the proper driver.

Rebooting: Like fussy little children, Macs are extremely difficult to dress. "Rebooting" means knocking the Mac out so you can put on new shoes on it. When it comes to, it's fairly well-behaved, for a while.

ROMs: Little black bugs that live on the video card. Drivers are just as fussy as Macs and screens, and will refuse to work unless they have the right ROMs. The ROMs do not serve any other visible purpose.

Cold solder joint: A seedy joint inside your Mac where drivers and other Mac elves hang out and get into all kinds of trouble. However, if you heat up a cold solder joint with a soldering iron, the elves run away and go back to their jobs.



It's Not Easy

Lee Hart

The world is a bit sadder place without Jim Henson. Thinking of him inevitably reminds me of Kermit the Frog. I think many of us identify with Kermit, who kept on being himself despite the taunts and jeers of others.

That's how I feel about working on little 8-bit computers when everyone else is going to Macs and PCs. So the following bit of filk is dedicated to Jim Henson, and all those struggling to do their own thing:

Ode to Eight Bits

by Lee Hart
Lyrics Copyright 1991 by Lee Hart
(Sung to the tune of Kermit the Frog's "It's Not Easy Being Green")

It's not easy using eight
when your friends all use sixteen.
They claim octal is passe,
and is doomed to fade away,
So change now 'fore it's too late.

But folks demand a lot from you
at sixteen or thirty-two.
They'll expect you to define
the 157th prime
In a millisec or two.

Pity those with only four
condemned as just calcula-tor.
They are forced to work as slaves
in ovens, clocks, and microwaves.
Such a dreadful mindless bore.
But eight's just right for ASCII codes.
characters and ESCape modes.
I can learn it byte by byte,
no segment registers in sight,
And no stressful address modes.

Eight counts the fingers I can see
and that suits me perfectly.
So I think eight bits will do,
and if it's all right with you,
Eight's exactly right for me.

THE FORERUNNER AIRCRAFT

by Rodford E. Smith

Part One: Background Technology

Foreword

Back in the Summer of 1989, I mentioned to a technically oriented friend that Burt Rutan's Advanced Composites, or one of the other homebuilt aircraft companies, should be able to design and market a kit aircraft capable of exceeding Mach 3. Estimated component price would be under a quarter of a million dollars. My friend was skeptical. In essence, he said "put up or shut up." Well, I started doing some research, and quickly realized that I had greatly underestimated the technology available. Indeed, the upper limit for the engine I planned to use was Mach 5. If a Japanese researcher is correct in his computer modeling, adding a cooling cycle at the inlet will allow a modified version of this engine to function at speeds above Mach 8! That's faster than anything short of a space vehicle has ever gone!

This, the first of two parts discussing the results of my work to date, will cover the technology behind the Forerunner aircraft. The second part will explain the details of the design for the Forerunner II and Forerunner III planes.

A few months after I started this project, I learned that a kit plane company is offering a Mach 1.4 homebuilt for $140,000. Their design is very conservative; they are using mostly steel for the structure, and an existing commercial aviation turbojet engine. They are also trying to get the thing certified by the FAA. I have also been told that several advanced homebuilders are working on supersonic planes. So, maybe I'm not so crazy. Neither of these planes requires techniques which have not been used before by kitbuilders. Indeed, the only unique feature in either design is the engine, and those are usually bought as discrete components anyway.

The project is by no means finished. Among other work that remains to be done, I need to locate a suitable high-temperature bonding agent. Also, I have not even begun to determine the exact cost of the finished kits. As mentioned above, I am aiming for a completion price of around a quarter of a million dollars for the Mach 3 version, with the Mach 8 version costing twice that. Many of the details presented here are subject to revision pending further research. Still, you can accept with confidence that the general forms of the aircraft described here and in Part Two are accurate.

A Brief History of High-Speed Flight

Mach 3 was first exceeded by the Bell X-2 in 1956. The plane and pilot were lost during the flight, due to an unexpected stability problem. The first manned aircraft to exceed Mach 3 successfully was the X-15, in 1960. This rocket plane eventually went on to reach a speed of Mach 6.7 (4520 mph) in 1967, though the record is unofficial. This flight nearly cost them the aircraft: the experimental ablative heat shield failed and parts of the plane actually burned off.

The first aircraft to cruise at or beyond Mach 3 for long periods were members of the Blackbird family. The first of the line, the A-12, made its initial flight in 1962, with the YF-12 and the SR-71 following later. A Blackbird exceeded Mach 3 for the first time in 1963. These planes were built with late fifties technology, and the fact that they still hold speed records is testimony more to the fact that most military planes don't need to fly that fast than to how inherently difficult it is to do so. The XB-70 Valkyrie was not quite as fast as the Blackbirds, but the two test articles both cruised in excess of Mach 3 for over an hour at a time on several occasions. Except for using compression lift (see below) the Valkyrie was even more conventional than the Blackbird!

The Mig-25 Foxbat doesn't really count here as an *operational* Mach 3 aircraft, since only the reconnaissance versions can make that speed, and those for only short bursts - and afterwards need to have the engines replaced!

The Engine

The Airturboramjet (ATR) was first invented back in the fifties, but apparently has not been successfully built yet. This isn't surprising when you consider the operating parameters. Given the materials advances made in the past 10 years, though, it should be possible to construct one now. In fact, this engine works better on a small scale, such as for use in a cruise missile or a homebuilt aircraft. In a larger version of the engine, the speeds at the tips of the compressor blades will exceed Mach 1 unless a reduction gear is added between the drive turbine and the compressor blades. So a small engine would be lighter and less complicated in proportion, and more reliable.

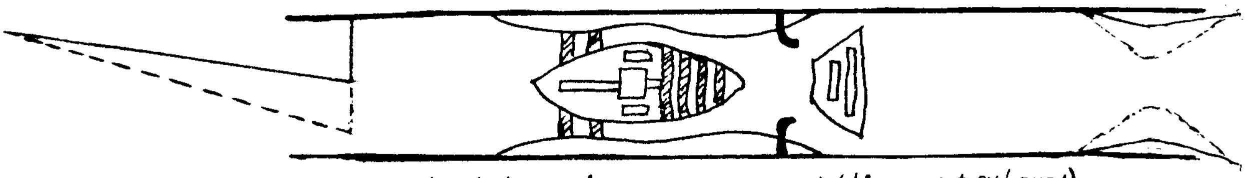
In essence, the ATR is a ramjet that creates its own head wind. (Figure 1.) It can start from static conditions, and continue to Mach 5. The concept is deceptively simple: a small turbine burns fuel and oxygen to drive a one- or two-stage compressor, with the fuel-rich exhaust then passing into a combustion chamber where it burns in the air driven backwards by the compressor. Above Mach 0.8 the ATR begins to act more and more like a ramjet, and above Mach 2 behaves almost exactly like one.

Unfortunately, the high temperatures and operating stresses involved require the turbine blades to be made from something like ceramic whisker/metal matrix composite, and they will probably have to be cooled by air or fuel pumped through their hollow centers. Such materials and techniques have only recently become practical.

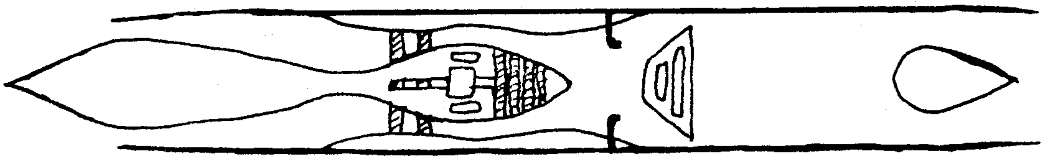
The interior of the engine would have to be lined with a ceramic which not only withstands high temperatures, but which is resistant to thermal shock. If the engine flames out at high altitude, or even if the pilot only throttles back too quickly, the temperature drop will be extreme.

The engine inlet is critical, and the design I have used is apparently unique in its details. Normally, any interruptions in the surface of an aircraft - such as engine inlets - are stepped away from the skin, to avoid disrupting the boundary layer flow. This is a thin film of air which tends to hug the surface of the plane's body. High-performance aircraft from the P-51 Mustang to the F-23 use this stepping technique, which is why the F-14 looks as if its engines are about to fall off. However, one of the greatest performance aircraft of all time, the F-104, uses a different approach. It has long, tapered cones attached to the body ahead of the inlets. These gently direct the boundary layer flow away from the body and into the engines, increasing the mass flow and the oxygen available for combustion in thin air. This is one of the reasons that, in some flight regimes, the Starfighter, built in the early fifties, can still show its heels to most first-line combat aircraft of today.

The inlet of the Forerunner is similar, using an angled plate (think of a corner cut on a slant from a cube) instead of a cone. This plate, or ramp, also helps create the complicated shock pattern needed to slow the inlet air to below the speed of sound. Supersonic flow is counter-intuitive; compressing a stream moving faster than sound *slows* it. This is because the increased density squeezes the molecules together until begin bouncing off each other, wasting energy and reducing the flow speed. Since the ATR is a subsonic flow engine, like any turbojet or ramjet, slowing the inlet air to below Mach 1 is necessary.



(Angled ramp intake, convergent/divergent exhaust)



(axial spike inlet and exhaust)

Fig. 1 Airturboramjet

The exhaust nozzle for such an engine is equally important. The ratio of the convergent/divergent section must be adjusted to match the conditions of flight, including engine power. I am hoping that a simple "blow open" nozzle will be sufficient, but a more sophisticated system may be required, using pressure sensors and hydraulic actuators.

The Forerunner aircraft depend on the ATR being available to achieve top performance. With conventional high-performance turbojet engines the top speed would only be a little above Mach 2, and the cost would be greater, although endurance would also increase.

General Plan

The basic form of the Forerunner family of aircraft consists of a twin-tailed, swept delta wing and canard foreplanes, so that it strongly resembles several past and current homebuilt aircraft. While these features were originally adapted due to this source of inspiration, there are legitimate technical reasons for using them.

High-speed flight is, of necessity, also high-altitude flight. In order to reduce the drag and heating from air friction the plane must cruise above 60,000 feet, perhaps even as high as 120,000 feet for Mach 6+ speeds. However, at such altitudes the thin air reduces the effectiveness of the controls. This is mitigated somewhat by the fact that the high speed makes the controls a little more effective. Still, the Blackbird aircraft sometimes find themselves in situations where the stall speed is only a few knots below the cruise speed.

In order to gain as much control authority as possible in the Forerunner, the surfaces needed to be placed far from the center of gravity, so they would have a longer moment arm to work through. This meant a canard design, with twin vertical tails placed at the wing tips.

The shape of the wing is reminiscent of that used on such planes as the Blackbird, the F-16XL and the F/A-18. The chines add pitch stability as well as lift, and help reduce the movement of the center of lift as the Mach number increases. Underwing fences, essentially extra fins, were added to help with the lateral stability.

Great care was taken to make sure the form followed area rule, which dictates that there be no sudden changes in cross section in supersonic aircraft. However, remember that the designs as shown in Part 2 are strictly back-of-the-envelope, "If it looks good it will perform good." work. While the final version will be close to this and have the same main features, a great deal of computer simulation and wind tunnel testing will be required to optimize the design.

General Design Philosophy

The Forerunner is intended as a sport craft, not a military or commercial plane. It can therefore be built more simply and lightly than otherwise, while still retaining an adequate safety factor. For instance, flaps are not needed, since the delta wing has good low-speed stall characteristics, especially when in ground effect during takeoff and on final approach. A Mach 3+ cruise time of 20 minutes is the target for the basic design. This does not sound like much, but with a ground speed of over 2100 mph you can travel about 700 miles in that time. Since the materials used in the skin and structure (see below) conduct heat poorly, this means that internal temperatures will stay low for such a short flight. There is no need for exotic materials inside the plane, and the engine can burn ordinary JP, both of these factors greatly reducing costs.

The fuel tanks will be bladders supported by the structure. There should be one in the fuselage and two in the wing, one on each side. I considered using the "wet wing" approach but decided that this was too complicated for the average builder. It could be offered as an option for those more skilled or more ambitious.

The main limiting factor on subsonic flying time for the Forerunner aircraft is due to the fact that the engine will only run below Mach .8 if bottled oxygen is supplied, and will probably still need to run the power turbine below Mach 1.5 to maintain full thrust. Later, more expensive versions of the engine may use any of several strategies to increase this duration. If nothing else, external tanks, similar to the FAST packs used for the F-15, may be available as an option.

As is stands now, the general flight profile calls for a steep climb to high altitude, to keep the speed below Mach 1 until the plane is high enough to avoid offending anyone, followed by rapid acceleration to get into ramjet mode as quickly as possible and a final climb to cruising altitude.

The cabin will be pressurized to 10,000 feet, and breathing air supplied through a mask. By eliminating whole-cabin air-conditioning I avoided a great deal of extra weight and cost. Military surplus equipment of this type is cheap and, if rebuilt by someone proficient in the task, very reliable. Equivalent commercial gear is also available.

The Airframe

As stated above, the major reason that a plane like this can be built now and not before is due to recent developments in materials technology.

Ceramic fiber fabric composite is already being used to replace metal in aircraft firewalls. While the ceramic cloth is heavier and more expensive for the same strength than graphite or kevlar, it is still vastly cheaper than titanium or the more exotic steels and other high-temperature alloys which have been used or proposed in the past. The skin and main internal structure of the Forerunner should be made of the ceramic composite. As mentioned above, I am still looking for a bonding agent which is very temperature tolerant. It wouldn't do for your plane to come unglued in flight.

The cockpit canopy is simple. Corning has recently made the ceramic glass used in their Visions cookware available in large sheets for industrial use. A double-walled canopy, with dry nitrogen at reduced pressure between the layers, should do nicely. This stuff is very tough; besides, you don't need to worry much about bird strikes at 60,000 feet.

As I proceeded with the design process, I discovered serendipity at work. Elements which I had included for one reason turned out to have additional benefits. For instance, I had not only swept the canards back, but down as well, so that the shock waves trailing off the tips would not interfere with the wing or rudders. Then I noticed that these same shockwaves were going between the engine nacelle and the wing fence on each side of it. By giving the nacelle flat sides, I enabled the Forerunner to trap this shock wave to produce compression lift in certain parts of the flight envelope. As far as I know, only one aircraft has done this before, the magnificent XB-70 Valkyrie. Additionally, spreading the lift over two sets of surfaces - the wing and the canards - reduces the intensity of the sonic boom and lowers the frequency to a range where it will produce less damage. This makes it much easier to get permission for supersonic overflights.

Similarly, placing the vertical tails at the tips of the wings helps control the tip vortices, reducing drag.

Suggested Reading

Most of the materials mentioned in the first section below are reports given at conferences. The rest are articles from technical magazines, except for the NASA Technical Note on propulsion systems for an advanced Space Shuttle. I obtained copies of these documents from the NASA liaison office at the University of Kentucky. The NASA catalog numbers are included.

"Turbojet-Ramjet Propulsion System for All-Body Hypersonic Aircraft," Mark H. Waters, Office of Advanced Research and Technology, Mission Analysis Division, Moffett Field, California. Published January, 1971. (Thorough analysis of high-speed propulsion, although the ATR is not included.) N71-15380."Performance Estimates for Space Shuttle Vehicles Using a Hydrogen- or Methane-Fuelled Turbojet-Powered First Stage," Gerald Knip, Jr. and Joseph D. Eisenberg, Lewis Research Center, Cleveland, Ohio, January, 1972. (Moderately good general reference.) NASA TN D-6634.

"Mach 5 Cruise Aircraft Research," NASA Langley Research Center, Hampton, Virginia. Published February, 1984. (Although this is a fairly recent report, it uses some very conservative materials technology. Ceramics aren't even mentioned, with the report recommending the use of superalloys for high-temperature areas. It does have a good discussion of the merits of LNG (methane) over hydrogen as a fuel. This is necessary for the Forerunner III.) X86-10217.

"A Parametric Study of a Gas-Generator Airturbo Ramjet (ATR)," Christopher A. Snyder, Lewis Research Center, Cleveland, Ohio. Presented at the 22nd Joint Propulsion Conference, cosponsored by the AIAA, ASME, SAE, and ASEE at Huntsville, Alabama, June 16-18, 1986. (Short overview of the operational characteristics of an ATR.) N86-31586.

"Airbreathing Propulsion Concepts for High Speed Tactical Missiles," Fred Zarlingo, Naval Weapons Center, presented at the AIAA/ASME/SAE/ASEE 24th Joint Propulsion Conference, July 11-13, 1988. (Good comparison of various engines for vehicles of the proper size class.) A88-44749.

"Advanced Airbreathing Powerplant for Hypersonic Vehicles," F. A. Hewitt and B. D. Ward, Rolls-Royce. Presented at the International Symposium on Air Breathing Engines, Athens, Greece, Sept. 3-8, 1989. (Review of general issues in Mach 5+ propulsion systems.) A90-12607.

Also Recommended

"Aerospace Propulsion," D. G. Shepherd. This is a general textbook, published by American Elsevier Publishing Co., Inc. It is no longer in print, but should be available through interlibrary loan programs.

"The Future of Flight," Leik Myrabo and Dean Ing. Published by Baen Books, second printing in 1986. A general overview of high-speed and high-altitude flight, although most of the work deals with using orbital lasers as energy sources for aircraft and spacecraft.

Oceans of garbage

SIR — Ducie Atoll in the south Pacific (24°40′ S, 124°47′ W) is one of the most remote islands in the world. It is 293 miles away from the nearest inhabited island (Pitcairn Island, population around 50), and more than 3,000 miles away from the nearest continent.

As part of the Sir Peter Scott commemorative expedition to the Pitcairn Islands I visited Ducie at the end of the March and surveyed the seaward shore of Acadia, the largest island in the atoll, for pieces of non-biodegradable flotsam of human origin. The survey was a belt transect, 1.5 miles long: I walked along the shore and recorded the objects I saw. The list is not complete: obviously the method is biased against smaller objects which were less visible from a distance. In total I recorded 953 objects, listed in the table. [...]

HARVEST FROM DUCIE ATOLL

Buoys: large (usually 30 cm diameter)	46
small (usually 20 cm diameter)	67
pieces (glass, plastic, polystyrene)	66
Crates (bread, bottle)	14
Plastic bottles (drinks, toiletries)	71
Glass bottles (produce of > 15 countries, 35% once contained whisky)	171
Jars	18
Unidentified (or broken) plastic pieces	268
Bottle tops	74
Segments of plastic pipe	29
Pieces of rope	44
Shoes	25
Fluorescent tubes	6
Light bulbs	6
Aerosol cans	7
Food/drink cans	7
Biro tops	2
Jerry cans (all holed)	4
Gloves (1 pair)	2
Tinned meat pie (leaking, but intact)	1
Cigarette lighters (non functional)	3
Doll's heads (1 male, 1 female)	2
Copper sheeting from hulls of wrecks	8
Lorry tyre	1
Plastic skittle	1
Glue syringe	1
Small gas cylinder	1
Construction-worker's hat (brown)	1
Plastic coat hanger	1
Toy soldier	1
Toy aeroplane	0.5
Tea strainer	1
Football (punctured)	1
Plastic foot mat from car	1
Asthma inhaler	1

(Letter to NATURE - July 11, 1991, page 113)

A Refrigerator Smarter Than You Are

Bill Higgins

(with lots of help from the Breakfast Crowd)

Joa Schürmann started it. "Should a refrigerator be used as a bulletin board?" He was surprised when a breakfast table full of techies answered with an emphatic "Yes!" Joa pointed out that every time he opens the refrigerator door, some random piece of paper falls off onto the floor. The solution to that problem, we replied, is to buy more and better magnets. Alternatively, he could buy a bulletin board for his kitchen. But it would be tough for his wife, Valli Hoski, to break the habit of sticking notices on the fridge—unless Joa hides all the magnets in the house.

Well, why not do it in software? Market a refrigerator with a big LCD display on the door. Users could type in messages, notes, and phone numbers, or they could use a scanner to put bitmapped images onto the display... At this point, the discussion was off and running.

I'm afraid I can't properly attribute all the ideas that flew across the waffles that morning in the restaurant in Kalamazoo. All I can say is that we had some immense number of Insleys present. I don't remember who said that the software should use the lower door for temporary messages, and the freezer door for long-term storage.

I think it was Chris Johnston who suggested putting a TV camera inside the refrigerator, so that you could study what food was available without opening the door and letting the cold air out. We argued for a while about whether the light would be on so the camera could see, but quickly dropped *that* line of questioning.

Well, if you're gonna put intelligence into your fridge, and you've got this big display available, and a video camera, it's a simple matter to include more instrumentation. Why do you stand with the door open and stare, anyway? You're taking inventory, trying to figure out what's available to eat. Why not do that in software, too? Almost everything you buy at the supermarket is marked with a UPC (Universal Product Code)—that "zebra" barcode. Strategically placed laser scanners inside your refrigerator could read the UPC of items as they go in or out. So the front-panel display could show a list of the contents in addition to images. Add inexpensive spring scales on each of the shelves, and the fridge can measure the weight of products and estimate how much remains in the container.

This is just the beginning. Tracking your purchases and consumption patterns over months, your refrigerator could begin to predict when you were running out of favorite foods. Perhaps it could generate shopping lists for you. If it were networked to your home computer and other devices, it could print shopping lists or send you electronic mail when something's running low. (Instead of memos "from the desk of Bill Higgins," there might be memos "from the refrigerator of Bill Higgins.") You could use your office modem to dial up and find what kind of dinner you'll come home to.

(After I told her about this, Audrey Helou pointed out that some Chicago grocery stores are delivering again. You could program your fridge to order food from your grocery, to restock with a minimum of hassle. Personally, I would miss my weekly stroll down the colorful aisles of the supermarket, America's cornucopia.)

Knowing the purchase dates of produce, meat, and other perishables, your refrigerator might tell you, "Better drink up that milk or it'll go bad in a couple more days!" Or it might just collect time-lapse images of your decaying vegetables to make an interesting movie. A ready-made science fair project for your kids.

"What's for dinner?" Your friendly fridge could juggle a cookbook with its inventory and its knowledge of your preferences, and suggest a number of possible recipes. Add diet information, and it could count calories of the food that you remove, and recommend selections which would help you hit targets on your diet: calories, fat, cholesterol, sodium, or whatever. It could track your grocery flow over time and estimate future changes in your weight.

Of course, your refrigerator is not the only place you keep food. But once engineers develop scales and UPC scanners that work in your fridge, adding them to your kitchen cupboards should be a simple extension.

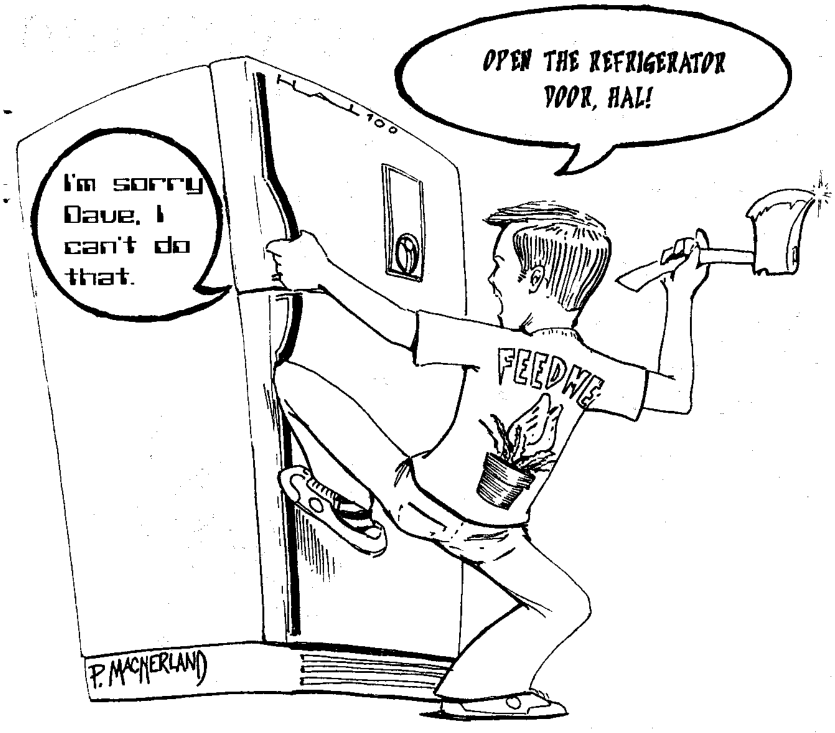
More than one person in the household? Just enter a password before you open the door, so the fridge can keep track of Joa's and Valli's consumption separately. To enforce correct accounting, the door might have a solenoid that wouldn't allow it to open unless correct passwords were typed in. This might be ideal for housemates who need to split food bills equitably.

A *Diet Policeman*^{TM} model might lock itself once you had extracted more than your share of calories in one day. It would open tomorrow—or (networked to counters on the intelligent treadmill or exercise bike) not until you'd worked off the effects of the excess calories or fat. Tyrannical, but effective at maintaining diet discipline that's otherwise difficult to achieve.

By the way, the Information Age refrigerator would be a gold mine of marketing information. Your grocer, along with hundreds of companies in the food and direct-mail industries, would be terribly interested in what your family eats, who eats it, and when. In an enlightened, privacy-conscious world, you the consumer could decide whether or not to release this information. You would profit from it, too: marketeers would pay you a fee to receive your refrigerator's databases. It might be a subscription arrangements, where you provide periodic updates for a periodic fee. Your fridge might automatically ship the data out to General Foods or whomever by electronic mail.

It would be impolite, of course, to snoop the refrigerators of your neighbors, though this would pose a new challenge to teenage hackers. And (though it seems far-fetched) fridge files might be a new information source for law enforcement officials, in certain cases. This already happens with phone bills and checking account records. Your refrigerator might be subpoenaed one day.

To start this revolution, all we need is to add some low-cost instrumentation, and a bit of processing power, to the old-style, Industrial Age refrigerator. Then we need to develop a bit of Refrigerated Intelligence (RI) software. So who'll be first to build a prototype?


OPEN THE REFRIGERATOR DOOR, HAL!
I'm sorry Dave. I can't do that.
HAL 100
FEEDME
P. MACNERLAND

Beyond the Smart Refrigerator

B. Gabriel Helou

Don't forget leftovers. This machine will need the ability to categorize food that you've cooked (not always a trivial task) and produce suitable UPC-style labels to affix to your Tupperware^{TM}.

And this system should not be limited to your refrigerator; in many households, a small percentage of food goes into the fridge. Similar monitoring and reporting devices would be needed for the cupboards, pantry, and that jar of jelly beans over on the desk.

This networked comestible tracking system could be extended to two-way communication between your home and the various shopping institutions in your neighborhood. Suppose you're at the Asian food market and have decided that making hot-and-sour soup for dinner would be a good idea, but you don't remember how much tofu you have and didn't think to check before leaving. The store could call your kitchen, via the proper user-entered password, and poll your refrigerator for the amount of tofu on hand. The possibilities are staggering.

But why leave this marvel of connectivity to handling grocery purchases alone? Coming back to the original seed of the discussion, "the refrigerator door as a message center," we could allow the cupboards, pantry, and even the jelly bean jar to function as message-posting devices. They would simply route a message to the host system (the refrigerator, that is). In turn, you should be able to use your jelly bean jar on your desk to poll the refrigerator door for messages.

The end result would be a system of networked appliances sending messages and recipes to each other. To reduce costs, the messages could be daisy-chained through a series of refrigerators via some sort of appliance-to-appliance-copy scheme, or AACP.

The impact of this on society should not be underestimated!

EARTH SCIENCE ALL WET

Raining on David Brin's Parade

by Kathy Thorne, Ph. D.

As a professional geographer and certified curmudgeon (junior grade), I feel I must respond to geographic ignorance the way a rhino responds to fire (at least according to *The Gods Must Be Crazy*) -- stomp it out before it spreads. In David Brin's novel, *Earth*, the author gives a plausible explanation of the driving forces behind the monsoon cycle over India:

> "During each winter the land beneath this pocket [of air trapped against the Himalayas] cooled, lowering air pressure, drawing moisture-laden clouds onto the foothills to pour down monsoon rains. Each summer the countryside warmed again, raising pressures, driving the clouds back to the sea."

Plausible, but wrong. The first sign of trouble with this explanation is the fact that precipitation in India peaks in July, while drought conditions prevail during the winter. The second problem is that cool air weighs more than warm air so cool air masses usually have higher air pressure than warm air masses. Brin is right in one respect: lowered air pressure is associated with precipitation.

OK, then, how do you make it rain? Well, precipitation results from the lifting of a parcel of air. As the air is lifted, it has less air above pressing down on it, so it expands. Gases cool as they expand, and cool air can't hold as much moisture as warm air, so the parcel of air drops its moisture as rain or snow. Anything that lifts air can cause precipitation.

Here's how the monsoon cycle really works. You start in early spring with some warm air parked over the Indian ocean sucking up lots of moisture. Next, you add increased insolation* due to the northward migration of the vertical rays of the sun. The land mass warms up faster than the water, heating the air mass that sits over the land. As it warms, this air becomes less dense and starts to rise. Nature abhors a vacuum, so she fills the empty space over the subcontinent with all this wet stuff that's been sitting out over the ocean. This air, in turn, heats up, rises, cools and sheds rain.

Now, why are these rains so heavy? This is where it really gets exciting. The centrifugal effect of the earth's rotation causes air masses from the northern and southern tropics to collide near the equator. This, plus the heating of the air as it moves toward the equator, produces a zone of rising air called the Inter-Tropical Convergence zone (ITC). The ITC follows the most intense insolation up toward the Tropic of Capricorn every northern-hemisphere summer, so about the time the wet air is moving in over the land, the ITC arrives. This added lift increases the convection of the warm moist air, so that it cools and sheds moisture even faster.

This phenomenon of lifting air masses, also explains things like lake-effect snow. These heavy snows occur over lakes and along narrow bands on their leeward (downwind) sides. They die out quickly, not because they miss the moisture from the lake, but because they miss the heat. Large lakes, particularly in the early winter, are warmer than the surrounding land. As cold air masses move over the water, their lower layers soak up heat, start to rise, and voila, you get snow. Hurricanes run on the same principle. Once you take them away from their energy source, the warm ocean, they die out pretty quickly.

So that's the explanation behind rain (also snow, sleet or hail, in case you're a curious postal courier.)

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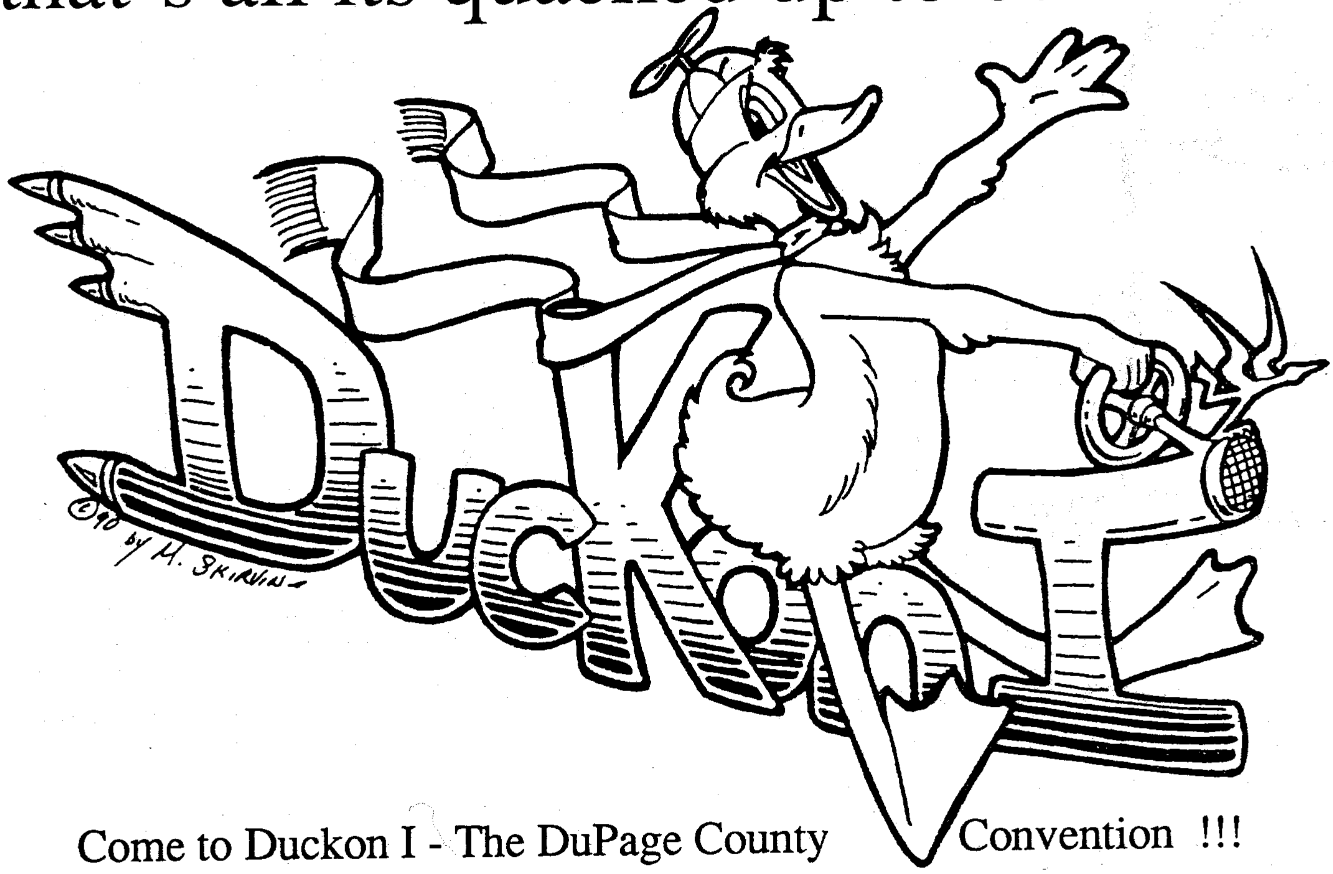
* the rate of delivery of solar energy per unit area. Not a misprint for "insulation." --*Ed.*

"Come to Chicagoland for a convention that's all its quacked up to be -"



Come to Duckon I - The DuPage County Convention !!!

(DuPage County SF Convention: A proDUCKtion of SUPERCONDUCKTIVITY)

We have no shame

Author Guest of Honor: Lois Tilton

Artist Guest of Honor: Mary Lynn Skirvin Johnson

Mad Scientist Guests of Honor: Todd Johnson & the GT Crew

Fan Guest of Honor: YOU! (if your name is drawn from pre-reg)

Activities include: Mad Scientist programming track, Art Show, Masquerade, Dance, Mike Jittlov film festival, Gaming, Bad Pun Contest, Bridge Vampire Gathering, DTV, Filking, Video Room, Hall of Huxters, Hospitality Suite, Dead Duck Party, and Klingon Love Poetry(w/heavy objects).

General Technics Berserker!

GT
GENERAL TECHNICS

Hotel: OAKBROOK MARIOTT approx $58 per night, has EXCELLENT POOL/SAUNA/JACUZZI !!

MEMBERSHIPS $25 TILL DEC. 1, 1991; $30 TILL APR. 1, 1992; $35 At The Door

Children-in-tow (under 7) free

Child Care available (write)

Fan GOH selected by random drawing from pre-registered member list on April 15, 1991.

Masquerade prize for the most creative use of Duck Tape!!

Dead Author GOH H.P. Lovecraft
Dead Mad Scientist GOH: Nikola Tesla
A Dance - With music you can DANCE to !!!
Mystery Science Theatre 3000 Fandom
Elvis and his flying saucers are coming
Do not eat. This is not a water toy.

DuPage Fandom
Furry Fandom
Silly Flyer Fandom
Party Fandom _
Fine Print Fandom

For memberships and information write:

DucKon I
P.O.Box 4843
Wheaton, IL 60189

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MEMORIAL DAY WEEKEND - MAY 22-24, 1992

PyroTechnics
The Now & Then Newsletter of General Technics

Published Quarterly

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PYROTECHNICS gleefully accepts contributions in the form of art and articles. If at all possible, text should be formatted 5 inches wide and justified. PLEASE! If you go to the trouble to format it, make sure that your finished copy is BLACK. Disks are also acceptable if you do your text as an IBM, Macintosh, or Atari (8 bit) file.

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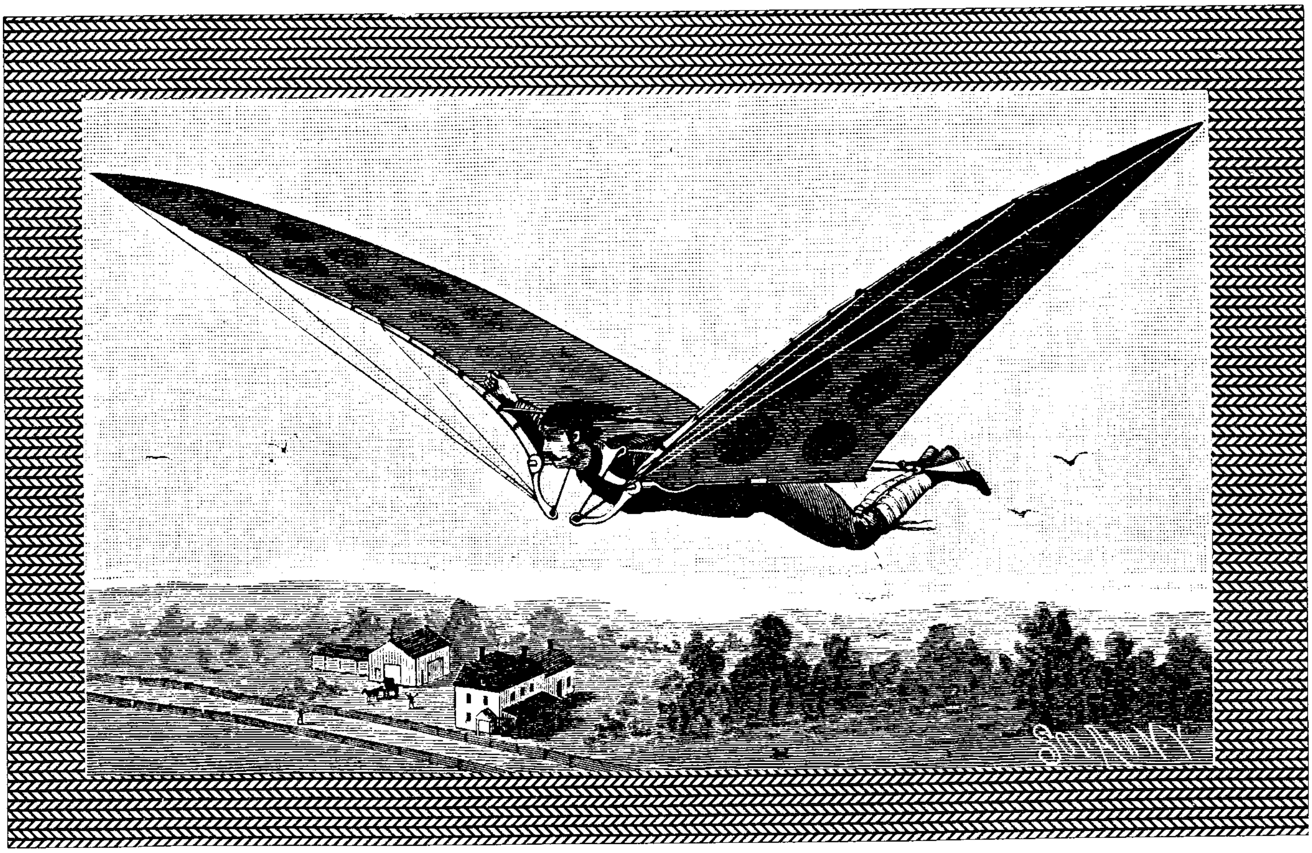

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